No. 201400046

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

An application requesting a certificate of protection for an alleged distinct variety of sexually reproduced, or tuber propagated plant, the name and description of which are contained in the application and exhibits, a copy of which is hereunto annexed and made a part hereof, and the various requirements of LAW in such cases made and provided have been complied with, and the title thereto is, from the records of the PLANT VARIETY PROTECTION OFFICE, in the applicant(s) indicated in the said copy, and Whereas, upon due examination made, the said applicant(s) is (are) adjudged to be entitled to a certificate of plant variety protection under the LAW.

Now, therefore, this certificate of plant variety protection is to grant unto the said applicant(s) and the successors, heirs or assigns of the said applicant(s) for the term of TWENTY years from the date of this grant, subject to the payment of the required fees and periodic replenishment of viable basic seed of the variety in a public repository as provided by LAW, the right to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or conditioning it for propagation, or stocking it for any of the above purposes, or using it in producing a hybrid or different variety therefrom, to the extent provided by the PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN, FIELD

'PH1TW8'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* Plant Variety Protection Office *to be affixed at the* ***City of Washington, D.C.*** *this eleventh day of September, in the year* ***two thousand and fourteen.***

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

20140046

dbc 09/05/2014

REPRODUCE LOCALLY. *Include form number and date on all reproductions* — Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
Pioneer Hi-Bred International, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME

3. VARIETY NAME
PH1TW8

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
7100 NW 62nd Avenue
P.O. Box 1014
Johnston, Iowa 50131-1014 USA

5. TELEPHONE *(include area code)*
(515) 535-~~6975~~ 3200

6. FAX *(include area code)*
(515) 535-~~2125~~ 4590

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PVPO NUMBER
20140046
FILING DATE
Oct. 31, 2013

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Corporation

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
Iowa

9. DATE OF INCORPORATION
March 5, 1999

FEES RECEIVED
FILING AND EXAMINATION FEES:
$ 4382.00
DATE 10/31/2013
CERTIFICATION FEE:
$
DATE

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Debora Phillips ~~Bradford D. Hall~~ 7250 NW 62nd Avenue
Pioneer Hi-Bred International, Inc.
Crop Genetics Research and Development
PO Box ~~85~~ 552 0552
Johnston, Iowa 50131-~~0085~~ USA

11. TELEPHONE (Include area code)
(515) 535-~~6975~~ 3305

12. FAX (Include area code)
(515) 535-~~2125~~ 6883

13. E-MAIL PVP.corn@pioneer.com
~~brad.hall@pioneer.com~~

14. CROP KIND *(Common Name)*
Corn

16. FAMILY NAME *(Botanical)*
Gramineae

15. GENUS AND SPECIES NAME OF CROP
Zea mays

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☒ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (*OPTIONAL*)
☐ YES ☐ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERCIALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED
(Follow instructions on reverse)

a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of Variety
d. ☐ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☒ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☒ Exhibit F. Declaration Regarding Deposit
g. ☒ Voucher Sample *(3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
h. ☒ Filing and Examination Fee ($4,382), made payable to "*Treasurer of the United States*" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD ONLY AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☐ YES *(if "yes", answer items 21 and 22 below)*
☒ NO *(if "no", go to item 23)*
☐ UNDECIDED

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☐ YES ☐ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☐ YES ☒ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☒ YES ☐ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
		B.D.Hall	Digitally signed by Bradford D. Hall Date: 2013.10.30 11:59:11 -05'00'
NAME *(Please print or type)*		NAME *(Please print or type)*	
		Bradford D. Hall	
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
		Sr. Research Associate	10/30/13

ST-470 (07-01-2009) designed by the Plant Variety Protection Office

2013 Oct 31 AM 10:37

GENERAL INSTRUCTIONS: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E, F; (3) for a tuber reproduced variety, verification that a viable *(in the sense that it will reproduce an entire plant)* tissue culture will be deposited and maintained in an approved public repository; and (4) payment by credit card or check drawn on a U.S. bank for $4,382 ($518 filing fee and $3,864 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice)*. **NEW:** With the application for a seed reproduced variety **or by direct deposit soon after filing**, the applicant must provide at least 3,000 viable untreated seeds of the variety *per se*, and for a hybrid variety at least 3,000 untreated seeds of each line necessary to **reproduce** the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. Mail application and other requirements to USDA, AMS, S&T, Plant Variety Protection Office, 1400 Independence Ave., S.W., Room 4512 – South Building, Mail stop 0274, Washington, DC 20250. Retain one copy for your files. All items on the face of the application are self-explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a payment by credit card or check payable to "Treasurer of the United States" in the amount of $768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. *(See Section 101 of the Act, and Sections 97.130, 97.131, 97.175(h) of the Regulations and Rules of Practice.)*

Plant Variety Protection Office
Telephone: (301) 504-5518 **FAX:** (301) 504-5291
General E-mail: PVPOmail@usda.gov
Homepage: http://www.ams.usda.gov/science/pvpo/PVPindex.htm

SPECIFIC INSTRUCTIONS:

To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and **provide evidence** that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, **Seed Regulatory and Testing Branch**, 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach replicated statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*

USPTO 2/13/2013 Application Serial No. 61/764,047

CLARIFICATION OF DATA IN EXHIBITS B AND C

Please note the data presented in Exhibit B and C, "Objective Description of Variety," are collected primarily at Johnston and/or Dallas Center, Iowa. The quantitative data in Table 1 are from two sample t-tests using data collected in the locations or environments shown. Qualitative trait data are presented from environments where the data best represents the variety(ies). The traits in Exhibit B collectively show distinct differences between the two varieties.

For the given year of data collection, our experimental design was set up so entries with similar maturities were planted near each other with one replication of the new variety grown in each environmental location. The experiment procedures generally involve two or three locations/environments with different planting dates, planted in 17.42 ft., 4 row plots for each variety. Approximately 24-30 plants emerged in each of the 4 rows for a total of around 96 to 120 plants being evaluated in each environment and 192 to 360 plants across locations or environments. For plant level traits, we sampled up to 20 representative plants from the middle 2 rows of the 4 row plot (group) of plants in each location/environment. For plot level traits we evaluated the 4 row plot (group) and gave a representative score or average on the 96-120 plants in the group within an experiment.

	GROWING DEGREE UNITS (GDU)			PRECIPITATION (Inches)		
	2012			2012		
Month	Johnston 1	Johnston 2	Dallas Center	Johnston 1	Johnston 2	Dallas Center
April	14	-	-	0.68	-	-
May	551	319	386	4.55	2.2	0.93
June	708	708	668	3.16	3.16	1.41
July	881	881	800	4.77	4.77	0.75
August	667	667	615	3.25	3.25	2.59
September	464	464	462	1.65	1.65	1.04
Totals*	**3285**	**3039**	**2930**	**18.06**	**15.03**	**6.72**
* GDU and precipitation were summed from planting thru September. Totals include aprox. 5 inches of irrigation applied to the Johnston fields.						

Growing Degree Units use following formula: GDU = ((T1+T2)/2)-50

Where T1 = minimum temperature for a given day with 50 degrees Fahrenheit as the minimum temperature used and 86 degrees Fahrenheit is the maximum temperature used.

Where T2 = maximum temperature for a given day with 86 degrees Fahrenheit as the maximum temperature used and 50 degrees Fahrenheit is the minimum temperature used.

GDUs are calculated each day and accumulated (summed) over certain number of days.

Please note: the 2012 growing season in Iowa was affected by historic drought and high temperatures. Analysis of variance between 2012 and the proceeding 14 years demonstrated that certain traits were more affected by these weather conditions than others. Ear diameter, Ear weight, Husk length and Kernel number per row showed higher than expected variance.

Exhibit A: Origin and Breeding History for PH1TW8

Pioneer variety **PH1TW8**, an inbred of yellow corn (*Zea mays L.*), was developed by Pioneer Hi-Bred International, Inc. from a cross made in 2005 in Marion, Iowa between PHE3D (PVP Certificate No. 200700308) and PHHHD (PVP Certificate No. 200900208) using the pedigree method of plant breeding. Varieties PHE3D and PHHHD are proprietary inbred lines of Pioneer Hi-Bred International, Inc.

During line development, crosses were made to inbred testers for the purpose of estimating hybrid combining ability. Yield trials were grown at Dallas Center, Iowa and other Pioneer research locations.

The criteria used in the selection of **PH1TW8** were yield per se and yield in hybrid combination. Late season plant health, grain quality, and stalk lodging resistance were important criteria considered during selection. Other selection criteria include: ability to germinate in adverse conditions, disease and insect resistance, pollen production and tassel size.

Variety **PH1TW8** has shown uniformity and stability for 6 generations and for all traits observed as described in Exhibit C – Objective Description of Variety.

No variants have been observed or are expected in **PH1TW8**.

Developmental History

→ The initial cross PHE3D x PHHHD was made in Marion, Iowa in 2005.

→ The F1 seed was planted at Puerto Vallarta, Mexico in 2005 and self-pollinated. The F2 seed was bulked.

→ The F2 seed was planted at Salinas, Puerto Rico in 2006 and self-pollinated. The F3 ears were selected.

→ The F3 seed was planted ear-to-row at Dallas Center, Iowa in 2007 and self-pollinated. The F4 ears were selected.

→ The F4 seed was planted ear-to-row at Dallas Center, Iowa in 2008 and self-pollinated. The F5 ears were selected.

→ The F5 seed was planted ear-to-row at Salinas, Puerto Rico in 2008 and self-pollinated. The F6 ears were selected.

→ The F6 seed was planted ear-to-row at Dallas Center, Iowa in 2009 and self-pollinated. The F7 ears were selected.

→ The F7 seed was planted ear-to-row at Puerto Vallarta, Mexico in 2009 and self-pollinated. The F8 ears were selected.

→ The F8 seed was planted ear-to-row at Dallas Center, Iowa in 2010 and self-pollinated. The F9 ears were selected.

→ The F9 seed was planted ear-to-row at Puerto Vallarta, Mexico in 2010 and self-pollinated. The F10 ears were selected.

→ The F10 seed was planted ear-to-row at Dallas Center, Iowa in 2011 and self-pollinated. The F11 ears were selected.

→ The F11 seed was planted ear-to-row at Puerto Vallarta, Mexico in 2011 and self-pollinated. The resulting F12 ears were selected to form the breeder seed.

Exhibit B: Statement of Distinctness

Variety PH1TW8 is most similar to Pioneer Hi-Bred International, Inc. proprietary inbred line PHE3D (PVP Certificate No. 200700308). Variety PH1TW8 is significantly different from PHE3D in the following traits (see Table 1).

Variety PH1TW8 has :

- a shorter average ear length (15.6 cm for PH1TW8 vs 17.8 cm for PHE3D)
- a lesser average ear weight (84.2 gm for PH1TW8 vs 115.0 gm for PHE3D)
- a lesser average number of kernels per row (20.5 kernels for PH1TW8 vs 26.8 kernels for PHE3D)
- red colored silk (red, 10RP3/8 for PH1TW8 vs light green, 2.5GY8/6 for PHE3D)

Table 1: Data supporting differences between PH1TW8 and PHE3D. The varieties were grown in two locations having different planting dates and growing environments. A two-sample t-test was used to compare differences between means.

ear length (cm)

Year	Location	VARIETY-1	VARIETY-2	Count-1	Count-2	Mean-1	Mean-2	Diff	Stdev-1	Stdev-2	SEdiff	t-value	prob
2012	JH1	PH1TW8	PHE3D	20	20	15.4	17.8	-2.4	0.46	1.45	0.21	-6.99	0.000
2012	JH2	PH1TW8	PHE3D	20	20	15.8	17.8	-2.0	0.62	1.36	0.22	-6.05	0.000

ear weight (gm)

Year	Location	VARIETY-1	VARIETY-2	Count-1	Count-2	Mean-1	Mean-2	Diff	Stdev-1	Stdev-2	SEdiff	t-value	prob
2012	JH1	PH1TW8	PHE3D	20	20	81.9	114.6	-32.7	17.07	15.69	3.66	-6.30	0.000
2012	JH2	PH1TW8	PHE3D	20	20	86.4	115.4	-29.0	19.10	20.17	4.39	-4.66	0.000

number of kernels per row (kernels)

Year	Location	VARIETY-1	VARIETY-2	Count-1	Count-2	Mean-1	Mean-2	Diff	Stdev-1	Stdev-2	SEdiff	t-value	prob
2012	JH1	PH1TW8	PHE3D	20	20	18.3	25.7	-7.4	4.16	2.87	0.79	-6.55	0.000
2012	JH2	PH1TW8	PHE3D	20	20	22.6	27.9	-5.3	3.19	3.31	0.73	-5.11	0.000

Exhibit C

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

OBJECTIVE DESCRIPTION OF VARIETY
Corn (*Zea mays* L.)

NAME OF APPLICANT (S)	TEMPORARY OR EXPERIMENTAL DESIGNATION	VARIETY NAME
Pioneer Hi-Bred International, Inc.		PH1TW8

ADDRESS (*Street and No. or RD No., City, State, Zip Code, and Country*)				FOR OFFICIAL USE ONLY
~~7301 NW 62nd Avenue~~ 7100 NW 62n Avenue				
Johnston	Iowa	50131-~~0035~~ -1014	USA	201400046

In the spaces on the left, enter the appropriate numbers that describe the characteristics of the application variety. On the right, enter the appropriate numbers that describe the characteristics of the most similar comparison variety. Right justify whole numbers by adding leading zeros if necessary. The variety that you choose for comparison should be the most similar one in terms of overall morphology, background and maturity. The comparison variety should be grown in field trials **with** the application variety for 2-3 location/years (environments) in the region and season of best adaptability. At least one year of trials should be conducted within the United States of America. In general, measurements of quantitative traits should be taken **from one trial on 15-25 randomly selected plants or plant parts** to obtain averages and statistics that describe a typical field of the variety. (Form technical content last updated Dec. 1992)

COLOR CHOICES (Use in conjunction with Munsell color code to describe all color choices: describe #25 and #26 in Comments section):

01 = Light Green	06 = Pale Yellow	11 = Pink	16 = Pale Purple	21 = Buff
02 = Medium Green	07 = Yellow	12 = Light Red	17 = Purple	22 = Tan
03 = Dark Green	08 = Yellow-Orange	13 = Cherry Red	18 = Colorless	23 = Brown
04 = Very Dark Green	09 = Salmon	14 = Red	19 = White	24 = Bronze
05 = Green-Yellow	10 = Pink-Orange	15 = Red & White	20 = White Capped	25 = Variegated (Describe)
				26 = Other (Describe)

STANDARD INBRED CHOICES (Use the **most similar** (in background and maturity) of these to make comparisons based on **grow-out trial data**):

Yellow Dent Families:

Family	Members
B14	CM105, A632, B64, B68
B37	B37, B76, H84
B73	N192, A679, B73, NC268
C103	Mo17, Va102, Va35, A682
Oh43	A619, MS71, H99, Va26
Wf9	W64A, A554, A654, Pa91

Yellow Dent (Unrelated):
Co109, ND246
Oh7, T232
W117, W153R
W182BN

White Dent:
CI66, H105, Ky228

Sweet Corn:
C13, Iowa5125, P39, 2132

Popcorn:
SG1533, 4722, HP301, HP7211

Pipecorn:
Mo15W, Mo16W, Mo24W

1. TYPE: (Describe intermediate types in Comments section)

2 1 = Sweet 2 = Dent 3 = Flint 4 = Flour 5 = Pop 6 = Ornamental 7 = Pipecorn
8 = Other (specify) DENT

Standard Inbred Name: A619
2 Type

2. REGION WHERE DEVELOPED IN THE U.S.A.:

2 1 = Northwest 2 = North central 3 = Northeast 4 = Southeast
5 = South central 6 = Southwest 7 = Other _____

Standard Seed Source: PI 587139
_____ Region Where Developed

Application Variety Data | Standard Inbred Data

Application Variety Data			Standard Inbred Data		
3. MATURITY (In Region Best Adaptability: show Heat Unit Formula in Comments section):					
DAYS	HEAT UNITS		DAYS	HEAT UNITS	
58	1242.0	From emergence to 50% of plants in silk	57	1209.0	50% Silk
59	1276.0	From emergence to 50% of plants in pollen	56	1177.0	50% Pollen
3	93.0	From 10% to 90% pollen shed	5	152.0	Pollen Shed Period
		From 50% silk to optimum edible quality			50% Edible
		From 50% silk to harvest at 25% moisture			Dry Down Period

4. PLANT:		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
197.0	cm Plant Height (to tassel tip)	5.36	20	179.1	cm Plant Height	8.06	20
70.3	cm Ear Height (to base of top ear node)	4.67	20	41.0	cm Ear Height	7.49	20
14.2	cm Length of Top Ear Internode	1.14	20	14.0	cm Internode	1.78	20
0.0	Average Number of Tillers	0.00	20	0.1	No. Tillers	0.22	20
1.8	Average Number of Ears per Stalk	0.41	20	1.0	No. Ears/Stalk	0.00	20
2	Anthocyanin of Brace Roots: 1 = Absent 2 = Faint 3 = Moderate 4 = Dark			1	Brace Root Anthocyanin		

5. LEAF:		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
9.5	cm Width of Ear Node Leaf	0.61	20	9.0	cm Leaf Width	0.76	20
75.4	cm Length of Ear Node Leaf	3.36	20	63.0	cm Leaf Length	3.68	20
6.3	Number of leaves above top ear	0.44	20	5.6	No. Top Leaves	0.51	20
23.5	degrees Leaf Angle (measure from 2nd leaf above ear at anthesis to stalk above leaf)	6.71	20	30.6	Leaf Angle	4.27	20
4	Leaf Color (Munsell Code) 5GY3/4			4	Leaf Color (Munsell Code) 5GY3/6		
5	Leaf Sheath Pubescence (Rate on scale from 1 = none to 9 = like peach fuzz)			8	Leaf Sheath Pubescence		
	Marginal Waves (Rate on scale from 1 = none to 9 = many)				Marginal Waves		
	Longitudinal Creases (Rate on scale from 1 = none to 9 = many)				Longitudinal Creases		

6. TASSEL:		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
1.2	Number of Primary Lateral Branches	1.06	20	8.3	No. Tassel Branches	1.33	20
19.8	Branch Angle from Central Spike	7.75	14	26.5	Branch Angle	5.47	20
36.1	cm Tassel Length (From top leaf collar to tassel tip)	2.55	20	40.6	cm Tassel Length	9.66	20
2	Pollen Shed (Rate on Scale from 0 = male sterile to 9 = heavy shed)			5	Pollen Shed Rate		
5	Anther Color (Munsell Code) 5Y8/8			19	Anther Color (Munsell Code) 5Y8.5/2		
2	Glume Color (Munsell Code) 2.5GY6/6			2	Glume Color (Munsell Code) 2.5GY6/6		
1	Bar Glumes (Glume Bands): 1 = Absent 2 = Present			1	Bar Glumes		

Application Variety Data	Standard Inbred Data

Note: Use chart on first page to choose color codes for color traits.

Application Variety Data				Standard Inbred Data			
7a. EAR (Unhusked Data):							
14	Silk Color (3 days after emergence) (Munsell code)	10RP3/8		1	Silk Color (Munsell code)	2.5GY8/6	
2	Fresh Husk Color (25 days after 50% silking) (Munsell code)	7.5GY5/6		2	Fresh Husk Color (Munsell code)	5GY6/8	
19	Dry Husk Color (65 days after 50% silking) (Munsell code)	2.5Y9/2		19	Dry Husk Color (Munsell code)	2.5Y9/2	
1	Position of Ear at Dry Husk Stage: 1 = Upright 2 = Horizontal 3 = Pendent			1	Ear Position		
6	Husk Tightness (Rate on scale from 1 = very loose to 9 = very tight)			6	Husk Tightness		
2	Husk Extension (at harvest): 1 = Short (ears exposed) 2 = Medium (<8 cm) 3 = Long (8-10 cm beyond ear tip) 4 = Very Long (>10 cm)			2	Husk Extension		
7b. EAR (Husked Ear Data):		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
15.4	cm Ear Length	0.46	20	13.6	cm Ear Length	1.60	20
37.8	mm Ear Diameter at mid-point	2.22	20	42.2	mm Ear Diameter	2.54	20
81.9	gm Ear Weight	17.07	20	92.3	gm Ear Weight	23.95	20
13.2	Number of Kernel Rows	1.36	20	16.0	No. Kernel Rows	0.97	20
2	Kernel Rows: 1 = Indistinct 2 = Distinct			2	Kernel Rows		
1	Row Alignment: 1 = Straight 2 = Slightly Curved 3 = Spiral			1	Row Alignment		
7.0	cm Shank Length	1.62	20	11.5	cm Shank Length	2.35	20
2	Ear Taper: 1 = Slight 2 = Average 3 = Extreme			2	Ear Taper		
8. KERNEL (Dried):		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
9.9	mm Kernel Length	0.68	20	10.1	mm Kernel Length	0.73	20
8.9	mm Kernel Width	0.60	20	8.4	mm Kernel Width	0.44	20
5.4	mm Kernel Thickness	0.50	20	4.7	mm Kernel Thickness	0.44	20
81.5	% Round Kernels (Shape Grade)		1**	60.9	% Round Kernels		1**
1	Aleurone Color Pattern: 1=Homozygous 2=Segregating (Describe)			1	Aleurone Color Pattern (Describe)		
7	Aleurone Color (Munsell code)	10YR7/14		7	Aleurone Color (Munsell code)	10YR7/12	
7	Hard Endosperm Color (Munsell code)	10YR7/12		7	Endosperm Color (Munsell code)	10YR7/12	
3	Endosperm Type: 1 = Sweet (su1) 2 = Extra Sweet (sh2) 3 = Normal Starch 4 = High Amylose Starch 5 = Waxy Starch 6 = High Protein 7 = High Lysine 8 = Super Sweet (se) 9 = High Oil 10 = Other			3	Endosperm Type		
34.4	gm Weight per 100 Kernels (unsized sample)		1**	26.9	gm Kernel Wt.		1**
9. COB:		Standard Deviation	Sample Size	Mean		Standard Deviation	Sample Size
22.5	mm Cob Diameter at mid-point	0.82	20	27.1	mm Cob Diameter	1.36	20
14	Cob Color (Munsell code)	10R2/6		19	Cob Color (Munsell code)	2.5Y9/2	
Application Variety Data				Standard Inbred Data			

Note: Use chart on first page to choose color codes for color traits.

Application Variety Data	Standard Inbred Data
10. DISEASE RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant); leave blank if not tested; leave Race or Strain Options blank if polygenic):	
A. Leaf Blights, Wilts, and Local Infection Diseases	
___ Anthracnose Leaf Blight (*Colletotrichum graminicola*)	___ Anthracnose Leaf Blight
___ Common Rust (*Puccinia sorghi*)	___ Common Rust
___ Common Smut (*Ustilago maydis*)	___ Common Smut
___ Eyespot (*Kabatiella zeae*)	___ Eyespot
___ Goss's Wilt (*Clavibacter michiganense* spp. *nebraskense*)	___ Goss's Wilt
___ Gray Leaf Spot (*Cercospora zeae-maydis*)	___ Gray Leaf Spot
___ Helminthosporium Leaf Spot (*Bipolaris zeicola*) Race _____	___ Helminthosporium Leaf Spot Race _____
___ Northern Leaf Blight (*Exserohilum turcicum*) Race _____	___ Northern Leaf Blight Race _____
___ Southern Leaf Blight (*Bipolaris maydis*) Race _____	___ Southern Leaf Blight Race _____
___ Southern Rust (*Puccinia polysora*)	___ Southern Rust
___ Stewart's Wilt (*Erwinia stewartii*)	___ Stewart's Wilt
___ Other (Specify) _____	___ Other (Specify) _____
B. Systemic Diseases	
___ Corn Lethal Necrosis (MCMV and MDMV)	___ Corn Lethal Necrosis
___ Head Smut (*Sphacelotheca reiliana*)	___ Head Smut
___ Maize Chlorotic Dwarf Virus (MCDV)	___ Maize Chlorotic Dwarf Virus
___ Maize Chlorotic Mottle Virus (MCMV)	___ Maize Chlorotic Mottle Virus
___ Maize Dwarf Mosaic Virus (MDMV) Strain _____	___ Maize Dwarf Mosaic Virus Strain _____
___ Sorghum Downy Mildew of Corn (*Peronosclerospora sorghi*)	___ Sorghum Downy Mildew of Corn
___ Other (Specify) _____	___ Other (Specify) _____
C. Stalk Rots	
___ Anthracnose Stalk Rot (*Colletotrichum graminicola*)	___ Anthracnose Stalk Rot
___ Diplodia Stalk Rot (*Stenocarpella maydis*)	___ Diplodia Stalk Rot
___ Fusarium Stalk Rot (*Fusarium moniliforme*)	___ Fusarium Stalk Rot
___ Gibberella Stalk Rot (*Gibberella zeae*)	___ Gibberella Stalk Rot
___ Other (Specify) _____	___ Other (Specify) _____
D. Ear and Kernel Rots	
___ Aspergillus Ear and Kernel Rot (*Aspergillus flavus*)	___ Aspergillus Ear and Kernel Rot
___ Diplodia Ear Rot (*Stenocarpella maydis*)	___ Diplodia Ear Rot
___ Fusarium Ear and Kernel Rot (*Fusarium moniliforme*)	___ Fusarium Ear and Kernel Rot
___ Gibberella Ear Rot (*Gibberella zeae*)	___ Gibberella Ear Rot
___ Other (Specify) _____	___ Other (Specify) _____
11. INSECT RESISTANCE (Rate from 1 (most susceptible) to 9 (most resistant) Leave blank if not tested): Standard Deviation Sample Size	Standard Deviation Sample Size
_____ Banks Grass Mite (*Oligonychus pratensis*)	_____ Banks Grass Mite
Corn Earworm (*Helicoverpa zea*)	Corn Earworm
_____ Leaf-Feeding	_____ Leaf-Feeding
_____ Silk Feeding: _____ mg larval wt. _____ _____	_____ Silk Feeding: _____ _____
_____ Ear Damage	_____ Ear Damage
_____ Corn Leaf Aphid (*Rhopalosiphum maidis*)	_____ Corn Leaf Aphid
_____ Corn Sap Beetle (*Carpophilus dimidiatus*)	_____ Corn Sap Beetle
European Corn Borer (*Ostrinia nubilalis*)	European Corn Borer
_____ 1st Generation (Typically Whorl Leaf Feeding)	_____ 1st Generation
_____ 2nd Generation (Typically Leaf Sheath-Collar Feeding)	_____ 2nd Generation
Stalk Tunneling: _____ cm tunneled/plant _____ _____	Stalk Tunneling: _____ cm tunneled/plant _____ _____
Fall Armyworm (*Spodoptera frugiperda*)	Fall Armyworm
_____ Leaf-Feeding	_____ Leaf-Feeding
Silk Feeding: _____ mg larval wt. _____ _____	Silk Feeding: _____ mg larval wt. _____ _____
Application Variety Data	Standard Inbred Data

Application Variety Data			Standard Inbred Data		
11. INSECT RESISTANCE (continued):					
		Standard Deviation / Sample Size			Standard Deviation / Sample Size
_____	Maize Weevil (*Sitophilus zeamaize*)		_____	Maize Weevil	
_____	Northern Rootworm (*Diabrotica barberi*)		_____	Northern Rootworm	
_____	Southern Rootworm (*Diabrotica undecimpunctata*)		_____	Southern Rootworm	
Southwestern Corn Borer (*Diatraea grandiosella*)			Southwestern Corn Borer		
_____	Leaf-Feeding		_____	Leaf-Feeding	
	Stalk Tunneling: _____ cm tunneled/plant	_____ _____	_____	Stalk Tunneling	_____ _____
_____	Two-spotted Spider Mite (*Tetranychus urticae*)		_____	Two-spotted Spider Mite	
_____	Western Rootworm (*Diabrotica virgifera virgifera*)		_____	Western Rootworm	
_____	Other (Specify) _____		_____	Other (Specify) _____	
12. AGRONOMIC TRAITS:					
_____	Stay Green (at 65 days after anthesis) (Rate on a scale of 1 = worst to 9 = excellent)		_____	Stay Green	
_____	% Dropped Ears (at 65 days after anthesis)		_____	% Dropped ears	
_____	% Pre-anthesis Brittle Snapping		_____	% Pre-anthesis Brittle Snapping	
_____	% Pre-anthesis Root Lodging		_____	% Pre-anthesis Root Lodging	
_____	% Post-anthesis Root Lodging (at 65 days after anthesis)		_____	% Post-anthesis Root Lodging	
_____	Kg/ha Yield of Inbred Per Se (at 12-13% grain moisture)		_____	Yield	

13. MOLECULAR MARKERS: (0 = data unavailable; 1 = data available but not supplied; 2 = data supplied)

____ Isozymes ____ RFLP's ____ RAPD's __1__ Other (Specify) SNPs

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COMMENTS: (e.g., state how heat units were calculated, standard inbred seed source, and/or where data was collected. Continue in Exhibit D.)

** For these plot-level traits, kernels from approximately 5 representative ears were sampled. 100 unsized kernels were counted and weighed. Up to 500 grams of kernels were sized by a 13/64 inch slot screen.

Insect, disease, brittle snapping, yield and root lodging data are collected mainly from environments where variability for the trait can be obtained within the experiment.

201400046

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued *(7 U.S.C. 2421)*. The information is held confidential until the certificate is issued *(7 U.S.C. 2426)*.

1. NAME OF APPLICANT(S)

Pioneer Hi-Bred International, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER

3. VARIETY NAME

PH1TW8

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*

7100 NW 62nd Avenue
P. O. Box 1014
Johnston, Iowa 50131-1014 USA

5. TELEPHONE *(Include area code)*

(515) 535-~~6975~~ 3200

6. FAX *(Include area code)*

(515) 535-~~2125~~ 4590

7. PVPO NUMBER

201400046

8. Does the applicant own all rights to the variety? Mark an "X" in the appropriate block. **If no, please explain.** [X] YES [ ] NO

9. Is the applicant a U.S. national or a U.S. based entity? **If no, give name of country.** [X] YES [ ] NO

10. Is the applicant the original owner? [X] YES [ ] NO **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?
[ ] YES [ ] NO **If no, give name of country:** _____

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?
[ ] YES [ ] NO **If no, give name of country:** _____

11. Additional explanation on ownership *(Trace ownership from original breeder to current owner. Use the reverse for extra space if needed)*:

Pioneer Hi-Bred International, Inc. (PHI), Des Moines, Iowa, and/or its wholly owned subsidiary Pioneer Overseas Corporation (POC), Des Moines, Iowa, is the employer of the plant breeders involved in the selection and development of PH1TW8. Pioneer Hi-Bred International and/or Pioneer Overseas Corporation has the sole rights and ownership of PH1TW8 pursuant to written contracts that assign all rights in the variety to PHI and/or POC at the time such variety was created. No rights to this variety are retained by any individuals.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

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dbc 09/05/2014

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	TEMPORARY OR EXPERIMENTAL DESIGNATION
Pioneer Hi-Bred International, Inc.	**7100 NW 62nd Avenue P. O. Box 1014 Johnston, Iowa 50131-1014 USA**	VARIETY NAME **PH1TW8**
NAME OF OWNER REPRESENTATIVE(S)	ADDRESS *(Street and No. or RD No., City, State, and Zip Code and Country)*	FOR OFFICIAL USE ONLY
Bradford D. Hall	**Pioneer Hi-Bred International, Inc. 7301 NW 62nd Avenue PO Box 85 Johnston, Iowa 50131-0085 USA**	PVPO NUMBER 201400046

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Digitally signed by Bradford D. Hall
Date: 2013.10.30 11:59:32 -05'00'

Signature

10/30/13

Date